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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/982,691	10/18/2001	Harpreet S. Sawhney	SAR 13931	8628
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P.O. BOX 980				
VALLEY FORGE, PA 19482-0980				

EXAMINER
LAVIN, CHRISTOPHER L

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 09/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/982,691

Applicant(s)

SAWHNEY ET AL.

Examiner

Christopher L Lavin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1 – 4, 6 – 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pitteloud (5,611,033) in view of Szeliski (5,986,668).

5. In regards to claim 1, Pitteloud discloses a system for stitching two or more images together. In the paragraph starting at column 7, line 2 Pitteloud specifies that 2 images are chosen to be merged (part a). In the paragraph starting at column 8, line 66 Pitteloud discloses that both images are divided up into a plurality of sections (part b). In the paragraph starting at column 8, line 42 Pitteloud discloses that a plurality of features are identified in the first image (part c). In Figure 9A-B and further described in the paragraph starting at column 11, line 37 Pitteloud discloses finding an optical solution amongst a plurality of local solutions (part e). In the paragraph starting at column 8, line 42 Pitteloud discloses that the system implements a loop, which leads to repeating steps d and e (part f). In the paragraph starting at column 10, line 23 Pitteloud discloses that the features identified in part c are used to search through the second image. Local optimal solutions are found for the best matches. Pitteloud, however, does not specify that optical flow should be used to match the features up in the second image.

6. Szeliski teaches in the paragraph starting at column 24, line 51 teaches that optical flow can be used to match image features for the purpose of stitching two images together.

7. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use optical flow to match features to the second image. Optical flow allows for a more precise matching of features. With a better match the system will be able to stitch the two images together with less ghosting. Providing a smoother looking image.

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8. In regards to claim 2, in the paragraph starting at column 8, line 66 Pitteloud discloses that both images are divided up into a plurality of rectangular blocks.

9. In regards to claim 3, in the paragraph starting at column 8, line 66 Pitteloud discloses that the first image is divided up into $N \times N$ blocks (in this case N is equal to 16). Some of these blocks are then used as features.

10. In regards to claim 4, in the paragraph starting at column 8, line 66 Pitteloud discloses that the blocks can be divided into smaller blocks in order to get a good feature. In the paragraph starting at column 9, line 11 Pitteloud discloses that "uniqueness" is used to determine good features to use. To determine "uniqueness" Pitteloud compares a block to its surrounding blocks. If all the blocks in a region have similar pixel values the size of a feature block, N , would have to be decreased in order to find a "unique" feature. Inversely if the pixels in a region vary greatly then the likelihood of finding a large area with unique traits is high and so the size of the feature block, N , could be increased. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a means to control the size of a feature block, N , where N is inversely proportional with the pixel to pixel variation in the surrounding region of a feature block. With a varying feature block size a more precise match with the second image could be found allowing for a better stitching operation and a better looking merged image.

11. In regards to claim 6, official notice is taken that it is old and well known in the art that edge detection can be used to extract regions of interest from an image. Therefore

it would have been obvious to one having ordinary skill in the art at the time of the invention to use edge detection to find features in the first image.

12. In regards to claims 7 and 8, Pitteloud discloses in lines 6 – 20 that a correlation score based on the sum of differences of pixel values, for example gray scale value, of neighboring pixels in the second image in comparison to the feature's pixel values (see equation 4). This correlation is used to find the optimal solution.

13. In regards to claim 9, Pitteloud discloses in the paragraph starting on column 12, line 4 that a parallax-related constraint, in this case stretch, is determined in order to find an optimal solution from amongst the local optimal solutions.

14. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pitteloud in view of Szeliski as applied to claim 1 above, and further in view of Herman (6,075,905).

15. In regards to claim 5, Pitteloud in view of Szeliski as shown above in the rejection of claim 1 discloses a system for stitching together two images using feature extraction to match the image portions having everything in common with claim 5 except for having an operator manually identify feature areas.

16. Herman teaches in the paragraph starting at column 5, line 24 that a user can manually specify feature areas for use in image stitching.

17. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use operator specified feature areas to match up the two images. With a user specifying the features, the size of the features is likely to be far

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larger than an automated approach would provide. With larger features the system may be able to find a better optimal solution for stitching the two images together.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

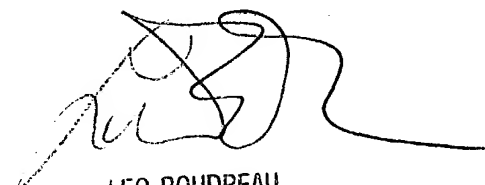
19. US Pat. 6,456,731 discloses a system for image stitching using optical flow.

20. US Pat. 6,331,860 discloses a system for image stitching which uses operator define feature areas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher L Lavin whose telephone number is 703-306-4220. The examiner can normally be reached on M - F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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